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A STATISTICAL ANALYSIS OF THE RELATION BETWEEN COST AND PRICE

SUMMARY

Marginal cost and price, 265. — Bulk-line cost, 267. — Dispersions of costs in different interests, 268. — Relations of price, cost, and gross profit on investment, 270. — Difficulties in using the Commission's costs, 271. — Book paper, 273. — Newsprint paper, 278. — Canned salmon, 281. — Sugar beets, 283. — Copper, 285. — Conclusions, 286.

THE economist usually maintains that over a sufficiently long period price will bear some relation to cost, even tho at any one time they may be entirely out of adjustment. As to just what that relation is, and whether there is conformity to modal, or marginal cost, the economists are not entirely agreed. Walker's contention that price will tend to conform to the cost of the marginal producer has only been generally accepted with a considerable number of qualifications. The concepts of the marginal producer and of the marginal cost require careful analysis before they can be used for any practical purposes.

There are two ways of defining the marginal producer and the marginal cost. The first defines the marginal producer of a certain year — assuming that year to be normal — as the producer whose sales realizations approximately equal his expenses (including interest on his invested capital). It is obvious that, according to this definition, the cost of the marginal producer of any one period corresponds with price, even tho his cost could not be called price-determining. The marginal producer in this sense is not necessarily the highest cost producer, inasmuch as the highest cost producer even in a normal period may suffer a loss. The marginal producer, as here defined, is the producer who at any normal period breaks even, i. e., earns just enough to pay his expenses. There are certain objections to this definition: it merely locates the position of the marginal producer on the cost curve after the price has been determined, and it can be used only when the period under consideration is a normal one.

Another method of defining the marginal producer practically assumes that the marginal producer of one year remains the marginal producer through a considerable period. This second definition classifies him as the producer who just manages to hold his position in the industry. In one year he may make a small profit; in another year he may suffer a small loss; in still another year he may merely earn interest on his capital investment. He usually remains in the industry because of the hope of future profit or because of the difficulty involved in the withdrawal of his investment. (It should be noted that even the producers with higher costs than those of the marginal producers will often remain in an industry for a considerable period due to the difficulty of withdrawing their capital investments. Economic theory naturally, but often inaccurately, assumes the absolute fluidity of capital.) The difficulty with the second definition is that in many cases there is no such producer existing in fact. The marginal producer of one year may and often does become a relatively low cost producer in the next year, even tho conditions of supply and demand remain reasonably constant. It may be necessary at times, therefore, to abandon the concept of the marginal producer as a continuous personality, and to direct attention to the marginal cost and to the marginal product. Since the marginal producer, as a person, does not always exist, it is impossible at times to locate any business organization that has occupied the position of the marginal producer through a series of years.

Both of these definitions assume that the marginal producer is the producer whose cost is equal to price under normal conditions of competition and whose cost is approximated by price over any considerable period, even tho at particular times abnormal conditions may have led to maladjustment. But neither of these definitions would enable the economist to locate the marginal cost immediately. The first presupposes the determination of price under normal competitive conditions before the marginal cost can be located, and the second is in many cases impracticable. As has been explained, the highest costs of any normal period are not necessarily the marginal costs; they are sporadic and usually apply to a very small part of the total production. They are the costs of producers who may at any time leave the industry. The marginal producer, therefore, must take a position in normal times somewhat lower on the cost curve than the position occupied by these highest cost producers. Furthermore, the marginal cost could not be expected in normal times to fall below the average or modal costs. The marginal position on the cost curve, therefore, would probably be somewhere between the highest costs and the modal costs. The modal costs are assumed to be the costs of the representative producers. Altho the modal costs are certainly in one sense the representative costs, it is not always true that they correspond accurately to the costs of the so-called representative producers. When the mode is not clearly defined or when there is more than one mode, this qualification is more evident. The limiting positions of the marginal cost would probably be, then, the highest cost at the one end and the modal cost at the other.

In order to determine the position of the marginal cost more accurately, it would be necessary to take cost groups for a number of industries and to find at what point along this curve normal competitive conditions caused price to fall. In the February *Quarterly Journal* (1918) Professor Taussig maintains that if differences in cost rest on physical causes — if they are due to forces in nature, not in man — the normal or long period price may be expected to conform to marginal cost, but that if they rest on the differing abilities of men, the normal price may be expected rather to conform to average cost, or at all events to fall below the "bulk line." The "bulk line" represents the position on the cost curve just below that occupied by the highest (usually sporadic) costs. The "bulk line" position is located at the break in the curve, i. e., at the cost group in which the production is considerable, but immediately below the groups in which the production is very small. It might be expected that the bulk-line cost would be found under normal conditions of competition to be the marginal or price-determining cost. Professor Taussig's analysis admits this for agriculture and mining. But only a comparison of a large number of actual costs and competitively fixed prices can solve this problem. In the present paper an attempt will be made to determine exactly where, under reasonably normal conditions of competition, prices actually fell along the cost curves which are available for study. Altho no large number of such costs and prices have been published, the method to be used will be set forth in this paper and applied to the available data.

If Professor Taussig's distinction between those costs affected by natural advantage and those affected by human ability is valid, the relation between price and cost may be different for the two types of industries.

Economists who emphasize this distinction probably would not maintain that agricultural costs and mining costs are never influenced by purely natural or even physical causes. Furthermore, in certain industries (primarily manufacturing), some companies produce their own raw materials; costs in such industries are, therefore, subject to some extent to the principles that apply to extractive industries.[1] The more significant distinction, then, is not merely between extractive and manufacturing industries. It is rather between industries where the costs are widely dispersed and stand in certain definite and fixed relations to each other and industries where costs group themselves around the cost of the modal producers. However, if it could be shown that the dispersion of the costs in manufacturing industries is not so great as in mining and agriculture, the hypothesis that human abilities do not result in such persistent cost differences as natural advantages might be proved. The average deviations (divided by the means) of the cost groups to be used for later analysis have been calculated as the measures of dispersion. The deviations were measured from the means rather than the modes, because the modes were not in all cases clearly distinguishable. For some of the groups there were two modes. Furthermore, in practically every case the actual mean was given. The coefficients of dispersion are given in the table on page 269.

Altho these figures are not sufficient for any thorogoing generalizations, the dispersions for the manufacturing costs do seem to have been, on the whole, lower than for those costs affected by natural causes. The figure for copper seems low for an extractive industry; this is also true of the sugar beet figure for the

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[1] See Mr P G Wright's article on sugar costs in this Journal, November, 1917, p. 101

Industry	Year	Coefficients of dispersion (based on the average deviations)
Book paper	1916	.15
	1917	.09
Newsprint	1913	.12
	1914	.11
	1915	.10
	1916 (½)	.11
Salmon	1916	.21
	1917	.33
Red salmon	1916	.21
	1917	.20
Sugar beets	1913	....
Michigan district	.	.20
Ohio-Indiana district	.	.16
California district	.	.21
Copper	1918	.18

Ohio-Indiana district. On the other hand, the figures for salmon seem somewhat large; this may be explained by the fact that a considerable number of the canners have their own exclusive fishing grounds, and, as a result, their costs are affected by natural factors as well as by human abilities. The figures indicate a tendency but present no conclusive evidence as to the distinction between manufacturing and extractive costs. It will be interesting to consider in the analysis which is to follow whether the dispersions of the various cost groups have affected the relations between costs and prices.

The statistical material on costs and prices is meager. The Federal Trade Commission, the successor to the old Bureau of Corporations, has published most of the figures which can be used in the present discussion. But even these figures are not entirely applicable to the kind of analysis which is here necessary. The Commission's investigations were undertaken for the very reason that more or less abnormal conditions prevailed in the industries under consideration. There are other minor difficulties involved in the use of its reports. In the paper in this Journal (November, 1919), already referred to, the necessity of considering interest on investment as a cost item in determining a price or the fairness of a price was implied. The accountants have been in the habit of combining interest and profit and of calling them return on investment. Of course, it is reasonable that the interest of any particular producer should bear some relation to his investment but that profit should bear any such relation presupposes that efficiency or good luck, as evinced by the lowness of cost, would be absolutely dependent upon the size of the investment. There may be reason to believe that the larger the investment per unit of product, the smaller will be the cost per unit of product — the man who has more machinery (an item of investment) will need less labor (an item of cost). For a number of other reasons, the man who has the larger investment can ordinarily be expected to have the lower cost. But this is true only in a general way and does not take into account the varying abilities and the varying fortunes of different producers. In some cases producers with small investments (per unit of product) may show low costs and make large profits. Thus, the profit (pure profit) of any one producer may be as high as 80 per cent of his investment, while that of another producer may be less than 5 per cent and justly so. That the total profits (gross profits, including interest and profit) of all the producers in an industry divided by the total invested capital will tend to be constant and probably even determinable is an economic doctrine which results from the fluidity of capital and from the additional fact that any one large group of men is probably about as clever as any other large group. If all of the producers in any one industry are earning abnormally large profits, capital will flow into that industry unless monopoly conditions or unfair methods of competition restrict it. And the reverse is true if the average profit in an industry is unusually small.

The fact that the total profits of an industry divided by the total investment should represent a rather constant percentage enables the student to determine whether the industry under consideration is operating under normal conditions. If an industry as a whole is earning 20 or 30 per cent (interest and profit together) on its total invested capital, the profits may be considered abnormally large; if the average return is less than 6 or 7 per cent, the profits may be considered abnormally small. In either case conditions could not be considered normal. Generally speaking, prices may be considered competitively fixed and in their normal relation to costs when the industry as a whole has earned an average gross profit of anywhere from 9 to 12 per cent on investment.

The costs given in the reports of the Federal Trade Commission include no interest on investment, and in some cases no investment figures are given. In practically none of the reports is the investment (per unit of product) for each group of producers given; in but a few cases is the average investment for the industry as a whole shown. The obvious difficulty in using interest on investment in cost analysis is the great difficulty involved in determining the interest rate that should be allowed. Accountants may be justified in restraining producers — particularly inefficient ones — from including large interest charges in cost before determining upon a proper selling price. Furthermore, the difficulty involved in squeezing out inflation before determining the true investment has militated against the inclusion of interest. In the analysis to follow, investment per unit of product is estimated, and interest is charged usually at about 5 per cent.[1]

In most of the Commission's reports, altho the average of the highest group of costs is usually given, it is impossible to find the highest cost. The modal cost can, of course, be approximated from the cost groups, but the average of the modal group can be found at a glance in most cases from the Commission's figures. From the definition of marginal cost already given it is clear that the exact position of the marginal cost could not be determined until after average price was known. Altho this may be strictly true, it will be shown that the position of the marginal cost will not be very different from what it would seem to be *a priori* when conditions of competition (as shown by return on investment) are reasonably normal. In most cases there will be a small production at very high costs; just below the production at these high costs there will be a relatively large production. Where this break occurs, the marginal product should probably be looked for. It is unfortunate that the different producers in the cost groups cannot be identified; otherwise, it would be interesting to find out in what cases the marginal producers continue to be marginal from year to year. This would be particularly valuable in considering the permanence of the modal or so-called representative producers.

There are certain other difficulties involved in the comparison of the Commission's costs with prices. In this paper the average price at which all the sales were made has been used. It has been assumed that the different prices at which the same commodity is sold during the year will tend to be uniform. Of course, this is often an unwarranted assumption, and will be particularly misleading when there are different grades.[1] The average price used was derived from net sales, which is ordinarily obtained after deducting outward freight, discounts, and allowances. These items were not included in cost and therefore should be deducted from price even when the manufacturer pays them. There is much to be said for including in cost cash discounts and outward freights (when the commodities are sold delivered).

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[1] For a discussion of the relation between interest, profit, and risk, see the writer's article in this Journal, November, 1919, on " Price Fixing and the Theory of Profit "

The cost and price figures for five industries have been chosen for statistical analysis. These industries have already been indicated in the table showing the cost dispersions (p. 269). They are book paper, newsprint paper, canned salmon, sugar beets, and copper.

Book-Paper Costs and Prices

The Federal Trade Commission has published the costs of producing book paper for the 39 principal mills in 1915 and 1916.[2] They are given in the table on page 274.

These figures are presented graphically on Charts V and VI.

The correspondence of the modal cost and the average cost represents the first problem to be considered. Exact correspondence assumes an absolutely symmetrical normal frequency curve. In this case, the curves for both years are asymmetrical. However, in 1915 the weighted average cost was $62.24, whereas the modal cost was

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[1] For varying prices realized, see copper prices, p 285

[2] The Book-Paper Industry, Government Printing Office, 1917, p 67, Table 21.

Group	1915				1916			
	No of mills	Tons produced	Per cent of total	Average cost per ton	No of mills	Tons produced	Per cent of total	Average cost per ton
I $50 and less than $55	5	116,718	18 10	$52 19				.
II. 55 " " " 60	4	147,094	22 81	57 03	6	210,639	27 27	$57 38
III. 60 " " " 65	12	176,527	27 37	62 05	5	136,463	17 66	63.92
IV. 65 " " " 70	8	85,112	13 20	67 51	1	35,838	4 64	67 45
V. 70 " " " 75	4	57,038	8 85	71 85	8	128,040	16 57	72 58
VI. 75 " " " 80	4	50,971	7 90	77 11	9	112,919	14 62	77 88
VII. 80 " " " 85	2	11,442	1 77	81 51	4	92,380	11 96	81.77
VIII. 85 " " " 90	..		.		4	33,732	4 37	87 62
IX. 90 " over	.		.	.	2	22,521	2 91	95.57
Total	39	644,902	100 00	$62 24	39	772,532	100 00	$69 87

$61.85. In 1916 the mode is not clearly defined. It is somewhere in the group between $70 and $80, whereas the average cost was only $69.87.

In order to compare the different costs with the average selling price per ton of book paper it will be necessary to make allowance for interest and selling expense. It has already been explained that no interest on investment was included in the costs shown in these tables. In this industry the average investment was apparently about $95.00 per ton in 1915, and appeared to be only about $75.00 per ton in 1916 (probably because of the larger output).[1] If 5 per cent interest were used as a basis for calculation, an average interest on investment would be about $4.75 in 1915 and $3.75 in 1916. Selling expense in these two years amounted to about $.80 per ton. It could not be assumed that these interest charges would be applicable either to the marginal costs or the modal costs, altho their applicability to the modal costs would probably be more justifiable. The higher cost producers might be expected to show lower interest charges than the average shown, inasmuch as high cost producers would probably have relatively small investments.

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[1] These investment figures have to be estimated from material in the Commission's report. They seem reasonably accurate

The average net price (per ton sold) in 1915 was $71.39.[1] Interest of $4.75 — which is probably somewhat larger than it should be, especially for the marginal producer — along with the selling expense ($.80), should be deducted from this price. If the resulting figure ($65.84) be compared with the cost groups it appears that price was not much above the group in which the mode falls. Apparently there was a certain quantity produced at no profit and even at a loss. Indeed, the industry averaged only 8.3 per cent (interest and profit) on its investment in this year. The bulk-line cost is difficult to determine in this table, but it is not impossible to locate it just above where the price might seem to indicate. Bulk-line cost and modal cost were not far apart in this case.

In 1916 the weighted arithmetic average cost ($69.87) was somewhere between the averages of the two modal groups ($57.38 and $72.58). The average net price (per ton sold) in 1916 was $86.83. If the interest of $3.75 and selling expense of $.75 be deducted, the figure obtained ($82.33) is much higher than the average cost or the cost of the two modal groups. Price in this case was as near the highest costs as the costs in the higher modal group, or even nearer; but price was abnormally high in this year, as is shown by the average return on investment (21.52 per cent).[2] If the costs above the group $80.00–$85.00 are assumed to be sporadic, price will seem to conform to the costs of the producers in the bulk-line group, which in this case was near the highest cost groups.

The two years for which these costs were shown were probably abnormal years for the industry. The Com-

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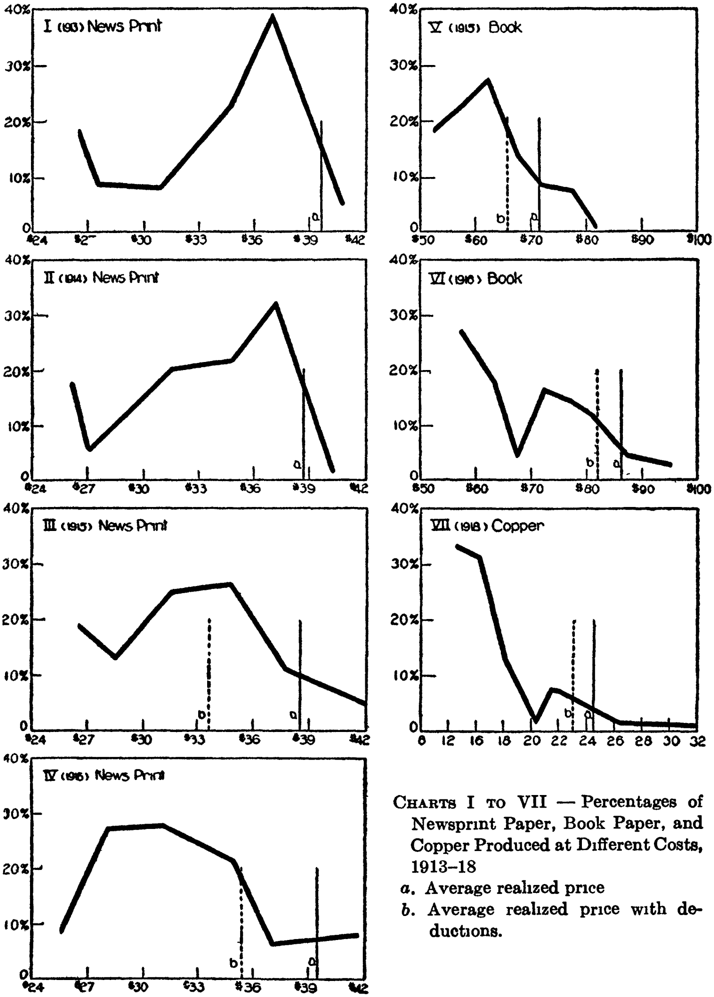
[1] Book-Paper Industry, p 78, Table 31.

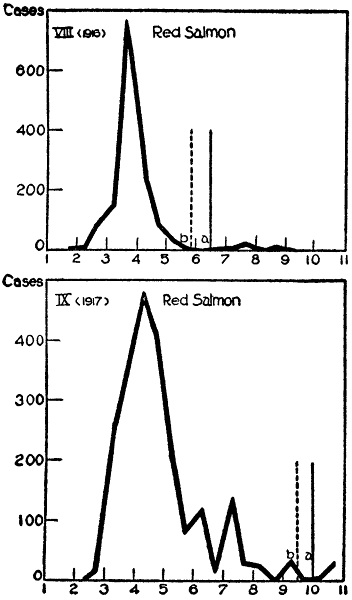
[2] Ibid , p. 80, Table 34.

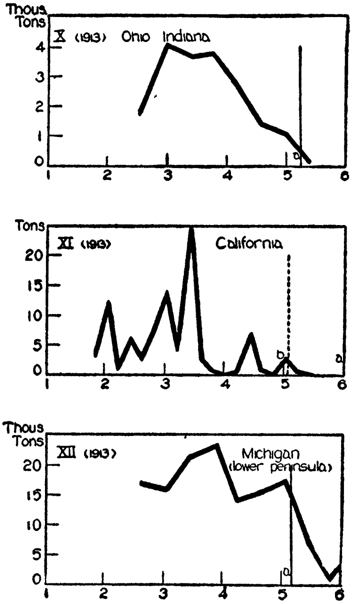


Charts I to VII — Percentages of Newsprint Paper, Book Paper, and Copper Produced at Different Costs, 1913–18

a. Average realized price

b. Average realized price with deductions.





Charts VIII and IX. — Cases of Red Salmon Produced at Different Costs in 1916–17.

a. Average realized price.

Charts X to XII. — Tons of Sugar Beets Produced at Different Costs in Various States in 1913.

b. Average realized price with deductions.

mission's report showed that the average return on investment for 21 companies (which were probably the larger and more successful companies) was 21.52 per cent in 1916. This was an abnormal profit; prices were high. But the average return in 1915 for the same companies was only 8.3 per cent. Probably both of these percentages were higher than the true average for the industry would have been, because investment figures were probably secured from the better companies. (It should still be remembered that this return includes interest and profit.) There were a number of companies that lost money in 1915 (i. e., did not earn any interest on their invested capital). Thus the low price in 1916 may have had some effect in bringing about the high price of 1917.

Newsprint Paper Costs and Prices

The Commission's newsprint paper costs in the United States mills for 1913, 1914, 1915, and for the first half of 1916 are given in the table on page 279.[1]

These figures are presented graphically on Charts I, II, III, and IV.

The average cost did not correspond in the first two years to the average costs of the modal groups. In both 1913 and 1914 it was approximately $4.00 lower than the modal costs. In 1915 the two corresponded more closely, and in 1916 they were practically identical. The mode in 1915 was about $33.95 and in 1916 about $31.34.

It is almost impossible to compare the prices of 1913 and 1914 with the costs of those years, as no investment figures are given. The average investment per ton in 1915 was apparently about $86.00.[2] Interest at 5 per

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[1] News-Print Paper Industry, p 9, Table 18.

[2] Investment figures have to be estimated from material in the Commission's report. These figures in the case of newsprint paper seem reasonably accurate See p 112.

Group	No of mills	Tons produced	Per cent of total	Average cost per ton
1913				
I. Less than $27	2	169,548	18 0	$26.51
II. $27 and less than $30	3	82,773	8 7	27.57
III. $30 “ “ “ $33	1	75,290	8.0	30.97
IV. $33 “ “ “ $36	8	214,678	22.7	34.66
V. $36 “ “ “ $40	14	361,602	38.3	36.93
VI. $40 “ over	2	40,472	4 3	40.80
Total	30	944,363	100.0	$33.42
1914				
I. Less than $27	3	192,705	18.5	$26.27
II. $27 and less than $30	1	59,681	5.7	27.17
III. $30 “ “ “ $33	4	210,113	20.1	31.66
IV. $33 “ “ “ $36	12	229,201	22.0	34 97
V. $36 “ “ “ $40	13	338,522	32.4	37.32
VI. $40 “ over	2	13,308	1 3	40.43
Total	35	1,043,530	100.0	$33.08
1915				
I. Less than $27	3	195,830	19 1	$26.64
II. $27 and less than $30	2	138,934	13 5	28.51
III. $30 “ “ “ $33	8	260,505	25.4	31.64
IV. $33 “ “ “ $36	11	276,672	27.0	34.75
V. $36 “ “ “ $40	8	120,199	11 7	37.74
VI. $40 “ over	3	33,321	3.3	43.67
Total	35	1,025,461	100.0	$32.21
1916 (first half)				
I. Less than $27	2	47,436	8.8	$25.56
II. $27 and less than $30	4	146,850	27 2	28.10
III. $30 “ “ “ $33	10	150,233	27.8	31 30
IV. $33 “ “ “ $36	8	117,729	21.8	34.96
V. $36 “ “ “ $40	6	34,441	6.4	37.03
VI. $40 “ over	4	43,147	8.0	41.76
Total	34	539,836	100.0	$31.93

cent would represent a deduction of $4.30 and selling expense a deduction of about $.60; thus the net price of $38.45 would be reduced to $33.55.[1] The final figure is approximately equal to the true modal cost (about $33.95), and is much lower than the bulk-line cost. But this is easily explained, as conditions in the industry were abnormal in that year; the average return on investment was only about 6 per cent. Prices were abnormally low. In 1916 the average investment per ton (first half) was $70; when therefore an interest charge of $3.50 and a selling expense of $.60 was deducted from price, there was left $35.30. This figure is higher than the modal cost and approximates the bulk-line position, altho a little below it. Even in this year, the industry earned only about 8 per cent on its invested capital.

The same situation prevailed in this industry that prevailed in the bookprint paper industry. The high prices in 1917, which prompted the Commission's investigations, may have been due in part to the low prices of 1915. It has been explained that in 1915 the average return on investment was about 6 per cent, whereas in 1916 it was about 8 per cent.

It is interesting to consider the prices of newsprint paper in 1913 and 1914, altho an estimate of proper interest charges is not easy to make. If $3.00 or $4.00 be subtracted from the average net price in 1913 ($39.50) and from that in 1914 ($38.76), the resulting figures will be even less than the modal costs in both years (somewhere between the modes and the arithmetic averages). In these years the bulk-line costs corresponded rather closely to the modal costs, and the rate of return on investment was apparently small.[2] The curves for 1913 and 1914 are noticeably asymmetrical, as considerable quantities were produced at the lowest costs.

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[1] See p 105, Table 26.

[2] See profits in Table 26, p 105 1913, $5 53, 1914, $4 94, 1915, $4 59, 1916, $6 75.

CANNED SALMON COSTS AND PRICES

The costs of producing a full case of canned salmon in 1916 and 1917 are as follows:

Range in cost per full case	1916 Number of full cases	1917 Number of full cases	Range in cost per full case	1916 Number of full cases	1917 Number of full cases
$1.50–$2 00	64,387	53,965	$10.50–$11 00	24,624	15,358
2.00– 2 50	402,895	.	11 00– 11 50	8,495	.
2.50– 3.00	1,377,603	483,466	11 50– 12.00	5,842	27,170
3.00– 3.50	814,279	1,304,415	12 00– 12.50	7,860	4,488
3.50– 4.00	993,283	1,133,893	12 50– 13 00	.	6,709
4.00– 4.50	788,314	1,095,815	13.00– 13.50	...	1,635
4.50– 5.00	377,270	794,158	13.50– 14.00	. .	....
5.00– 5.50	125,573	541,411	14.00– 14 50		....
5.50– 6.00	100,770	625,873	14 50– 15.00	. .	.
6.00– 6.50	27,010	306,615	15.00– 15.50	....	....
6.50– 7.00	22,291	298,373	15.50– 16.00	. .	.. .
7.00– 7.50	166,304	383,602	16 00– 16.50	.	21,853
7.50– 8.00	48,430	158,687	16.50– 17.00	.	. ..
8.00– 8.50	1,288	164,675	17.00– 17 50	. .	21
8.50– 9.00	4,322	14,101	17.50– 18 00	....	...
9.00– 9.50	....	112,123	18.00– 18.50	..	2,489
9.50–10.00	....	20,467	18.50– 19.00	. .	1,393
10.00–10.50	....	133,158	19.00– 26 50	.. .	3,574

The difficulty in comparing the average price of canned salmon with the costs arises from the differences in grades. Even in any one kind of salmon there are different grades of meat, which bring different prices when canned; and salmon from different sections bring different prices. A small amount of very fine or very expensive canned salmon, such as might bring a high price, would not affect the average price materially; but it would apparently have a great effect on the marginal cost. Thus, the average price in 1916 was $4.90, very much nearer the averages than the higher costs. In 1917 the average price ($7.28) moved higher on the cost curve, but prices of salmon in 1917 were abnormally high. In this industry the interest on investment was probably about $.15 to $.20 per case in 1916 and 1917.[1]

In order to get figures of any value the cost of producing a certain grade should be compared with the price of that grade. As the Commission's report gives the best figures for the grade "red," these will be analyzed.[2]

1916		1917	
Range in cost	Red	Range in cost	Red
$1.50 - $1.99	.....	$2.00 - $2.49	......
2.00 - 2.49	6,591	2.50 - 2.99	10,972
2.50 - 2.99	95,171	3.00 - 3.49	268,265
3.00 - 3.49	158,392	3.50 - 3.99	367,364
3.50 - 3 99	767,887	4.00 - 4.49	486,634
4.00 - 4.49	258,382	4.50 - 4.99	422,943
4.50 - 4.99	91,567	5.00 - 5.49	202,688
5.00 - 5.49	33,933	5.50 - 5.99	85,717
5.50 - 5.99	. ....	6.00 - 6.49	120,802
6.00 - 6.49	......	6.50 - 6.99	20,502
6.50 - 6.99	2,347	7.00 - 7.49	114,082
7.00 - 7.49	5,032	7.50 - 7 99	32,104
7.50 - 7.99	11,816	8.00 - 8.49	27,725
8.00 - 8.49	......	8.50 - 8.99	. . .
8.50 - 8 99	4,322	9.00 - 9.49	35,666
Over 9.00	... ..	9.50 - 9 99	. .
		10.00 - 10.49	8,445
		Over 10.50	33,834

These figures are presented graphically on Charts VIII and IX.

In 1916 the opening price of "red" was $6.00 per case for most companies; some companies asked $6.40. The opening price can be taken as the approximate average gross price. Unless the investment per case was very different for this grade than for all other grades, only $.15 or $.20 need be deducted for interest and about $.30 for selling expense. Deductions for cash discounts and other allowances cannot be estimated. The modal cost was about $3.80; the bulk-line cost was probably about $5.25. Some salmon was produced at higher costs, but these seem sporadic and unusual. Profits in this year were abnormal as the average return on investment was 22 per cent.[1]

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[1] Average investment per case in 1916 was $4 97 and ranged from $2 49 to $7 91. Average investment per case in 1917 was about $4 31 and ranged from $2.70 to $9 00 per case.

[2] Report, p. 43, Table 16.

In 1917 the opening price was $9.40 per case for most companies; some companies asked $10.00. After deducting the same interest charges ($.15 or $.20), and the same selling expense of $.30, and estimating allowances to be deducted in order to arrive at net price, the net price minus interest will be approximately equal to the highest costs. The modal cost was only $4.22 in this year. The price of salmon in 1917 was abnormally high, and was not well adjusted to cost. The average return in investment was 52 per cent.[2]

THE COSTS AND PRICES OF SUGAR BEETS

The costs of growing sugar beets (per ton) in three districts in 1913 are given in the table on page 284.

These figures are presented graphically on Charts X, XI, and XII.

It is impossible to determine the investment (per ton) from the Commission's report. It can probably be assumed that the interest on the investment was approximately $1.00 per ton. This figure applies better to California than to the other districts.

In the Ohio-Indiana district the average net price was about $5.26 per ton. The highest cost group in this district ranged between $5.20 and $5.60. If the deduction

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[1] Report, p. 61, Table 28.

[2] Ibid., p. 61, Table 28.

OHIO-INDIANA DISTRICT

Range in cost (per ton)	Tons produced
$2.4 -$2.8	708
2.8 - 3.2	1402
3.2 - 3.6	913
3.6 - 4.0	995
4.0 - 4.4	635
4.4 - 4.8	312
4.8 - 5.2	205
5.2 - 5.6	11

CALIFORNIA DISTRICT

Range in cost (per ton)	Tons produced
$1.7 -$1.9	3,161.70
1.9 - 2.1	11,877.68
2.1 - 2.3	1,088.00
2.3 - 2.5	5,435.20
2.5 - 2.7	2,816.00
2.7 - 2.9	7,962.50
2.9 - 3.1	13,955.05
3.1 - 3.3	4,266.50
3.3 - 3.5	24,790.44
3.5 - 3.7	2,780.00
3.7 - 3.9	770.00
3.9 - 4.1	.
4.1 - 4.3	636.30
4.3 - 4.5	6,944.00
4.5 - 4.7	959.00
4.7 - 4.9	. ....
4.9 - 5.1	2,960.00
5.1 - 5.3	572.50
5.3 - 5.5	..... .
5.5 - 5.7	.....
5.7 - 5.8	.. . .
5.9 - 6.1	200.00
6.1 - 6.3	.. ...
6.3 - 6.5	.....
6.5 - 6.7	.. .

CALIFORNIA DISTRICT (*cont.*)

Range in cost (per ton)	Tons produced
$6.7 -$6.9	.....
6.9 - 7.1	......
7.1 - 7.3	....
7.3 - 7.5	......
7.5 - 7.7	......
7.7 - 7.9	. ..
7.9 - 8.1	...
8.1 - 8.3	1,100.00

MICHIGAN (LOWER PENINSULAR) DISTRICT

Range in cost (per ton)	Tons produced
$2.4 -$2.8	1,721.18
2.8 - 3.2	1,629.10
3.2 - 3.6	2,202.99
3.6 - 4.0	2,391.10
4.0 - 4.4	1,426.75
4.4 - 4.8	1,534.42
4.8 - 5.2	1,793.42
5.2 - 5.6	770.20
5.6 - 6.0	69.51
6.0 - 6.4	342.10
6.4 - 6.8	196.00
6.8 - 7.2	13.28
7.2 - 7.6	......
7.6 - 8.0	......
8.0 - 8.4	48.08
8.4 - 8.8	..... .
8.8 - 9.2	10.38
9.2 - 9.6	13.38
9.6 -10.0	....
10.0 -10.4	61.66
10.4 -10.8	......
10.8 -11.2	.. ...
11.2 -11.6	21.84
11.6 -12.0	38.20

for interest be made, it will be clear that the average price in this district was far below the highest cost and approximated the bulk-line position. The average cost was only $3.50, a little higher than the modal cost.

In the Michigan district the average net price was

$5.54 per ton. Altho the costs above $7.20 per ton may be considered sporadic, price did not conform to the higher marginal costs in this district, after making allowance for interest. Moreover, price was not much above the modal cost, which was about $3.58.

In the California district the price ($6.01) was higher than the marginal costs (not the highest costs) even when interest on the investment, which is probably somewhat larger in California, is taken into consideration. The modal cost was about $3.42.

It should be noted that the reason for the Commission's investigation was the alleged low prices paid farmers for sugar beets. The Commission's investigators, however, did not believe that the truth of this contention was established by the investigation. No average return on investment for these sections was published in the report.

THE COSTS AND PRICES OF COPPER

The costs of producing copper in 1918, as determined by the Federal Trade Commission, were as follows:[1]

	No of est.	Pounds produced	Per cent of total	Average cost per lb	Average selling price per lb	Average investment per lb.
Cost less than 15 cents	*6*	424,340,257	33 84	12 630	24.357	22.428
" 15 to 17½ cents	7	395,672,390	31.56	16 284	24.430	33.278
" 17½ " 20 cents	8	169,578,109	13 53	18.078	25 073	31.453
" 20 " 21 "	5	36,871,193	2.94	20.477	23 664	40.419
" 21 " 22 "	5	91,812,263	7 32	21.605	23 108	36.412
" 22 " 24 "	7	90,111,068	7.19	22.090	24 207	29.998
" 24 " 28 "	8	33,955,962	2 71	26.273	24 455	20.961
" over 28 cents	7	11,426,343	.91	35.989	24.172	93 629
Total and average	53	1,253,767,585	100.00	16.700	24 388	29.779

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[1] See Cost Reports of Federal Trade Commission, Copper, June 30, 1919

These figures are presented graphically on Chart VII.

The average selling prices realized by the producers in the different cost groups varied somewhat; but the average selling price for all the companies was 24.388 cents. The bulk-line companies received approximately 24 cents for their product. The government fixed the price of copper at 23½ cents a pound, effective September 21, 1917, and this price prevailed until July 2, 1918, when it was put at 26 cents and remained so for the balance of the year.

The investment also varied for the different companies, but the investment of the bulk-line producers was probably somewhere between 20 and 30 cents. Interest at 5 per cent would be about 1 cent or 1½ cents. If this interest deduction be subtracted from the price, the result would be anywhere from 22.5 cents to 23.5 cents. The bulk-line cost seems to be between 19 and 23 cents. Thus price was even above the marginal costs. This is explained by the fact that the industry averaged more than 25 per cent on its investment.

CONCLUSIONS

The deductions to be drawn from the material here presented are only tentative. Cost groups of this kind should be so presented in the future as to enable investigators to identify (if only by number) the different producers represented, and particularly those at the bulk line. The investment for each group of producers should be indicated, as in the copper figures shown above. More data must be available before final conclusions can be presented. During the war the Federal Trade Commission obtained costs for a number of industries. These are being published, but are not entirely suitable for the present purpose because the prices for the industries represented were not competitively determined but fixed by the various price-fixing agencies, and for the further reason that investment figures are not usually given. If the conclusions to be set forth in the next paragraph are not borne out by further investigation, all that the writer can claim as the *raison d'être* of this paper is the method of inquiry which it sets forth.

From the figures presented it appears that, if the average return on investment is an index of normality, in no case were the industries represented operating under absolutely normal conditions of competition. However, in those years which were more nearly normal, price was in practically every case considerably above the modal or average cost and approximated, generally speaking, the bulk-line position. This was as true of the manufacturing as of the extractive industries, and as true of the smaller dispersion group as of the larger dispersion group. Bookprint paper in 1916 is the one case where, even with a high return on investment, the price was not much above the marginal or bulk-line cost. This may be explained by the small degree of dispersion for the costs of the industry in that year. More data may bear out the contention that the price-cost relation is affected by the degree of dispersion of the costs. Until such data are procurable, the generalization to be drawn from these analyses is as follows. Price approximates bulk-line or marginal cost under normal conditions of competition, i. e., when the total gross profits (including interest and profit) of all the producers in an industry amount to approximately 10 per cent of the entire capital invested in the industry; and price is higher or lower than bulk-line cost whenever the return is greater or less than approximately 10 per cent.

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